

Broad geographic, taxonomic and ecological patterns of interpopulation variation in the dietary habits of snakes

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Because of their unique morphological and ecological characteristics (i.e. being obligate carnivorous, solitary, and ingesting their prey whole), snakes are expected to show unusual dietary patterns compared to other ectothermic vertebrates, and the best way to explore this is to analyse the snake dietary patterns globally. Here I review and analyse the peer-reviewed snake diet literature available in order to explore whether there are broad patterns in the interpopulation variability of diet composition in these unique ectothermic predators. I collated data for 181 independent populations belonging to 58 species of snakes from some of the main families (1 Boidae, 2 Pythonidae, 27 Colubridae, 10 Elapidae, and 18 Viperidae) and from all the continents (4 from South and Central America, 13 from North America, 12 from Europe, 18 from Africa, 4 from Asia, and 7 from Australia). All these populations satisfied some precise criteria of inclusion, and were therefore re-analysed in a comparative perspective. I classified each literature entry according to 1) snake species, 2) snake family, 3) geographic position (continent) of the study areas, 4) climatic region (temperate versus tropical), 5) guild (if the species is aquatic, terrestrial, or arboreal), 6) hunting strategy (sit-and-wait versus active forager), and 7) venom (if the species is venomous or not). All these seven factors were analysed by GLM procedures to evaluate their effects on the interpopulation diet variation within snake species, that was assessed by using a univariate similarity index. The various taxonomical categories of snake prey were grouped according to two different levels of taxonomic affinity: a) general affinity, e.g. frogs and toads, salamanders, lizards, birds, etc., and b) close affinity, by grouping prey types belonging to a same genus. My study revealed that, within-species snake populations showed a very low variability in terms of diet composition. As for the general affinity criterion, there was no single factor that produced a significant effect on the interpopulation diet variation but, with regard to the interaction terms between factors, significant effects were determined by 1) continent \times climatic region (with Asian, African and South-American tropical populations having significantly lesser similarity values), 2) continent \times hunting strategy (diets being less diverse in ambush predators in Africa, Asia and South America), and 3) climatic region \times guild (with arboreal tropical snakes showing less interpopulation similarity). As for the close affinity criterion, there was also no effect of single factors on interpopulation diet variability, but the interaction term hunting strategy \times venom was significant, with sit-and-wait venomous species being less variable in their diet composition. Snake family was completely un-influent in determining any effect on snake interpopulation diet variation. The broad reasons that may explain these generalized patterns are discussed.

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